

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**

THIS PAGE BLANK (USPTO)

OPIC
OFFICE DE LA PROPRIÉTÉ
INTELLECTUELLE DU CANADA



CIPO
CANADIAN INTELLECTUAL
PROPERTY OFFICE

Ottawa Hull K1A 0C9

(21) (A1) 2,108,069
(22) 1993/10/08
(43) 1995/04/09

(51) INTL.CL.⁵ A63B-059/14

(19) (CA) APPLICATION FOR CANADIAN PATENT (12)

(54) Method of Making a Hockey Stick and Structure of Such
Hockey Stick

(72) Tsai, Son-Kung - Taiwan ;

(71) Same as inventor

(57) 8 Claims

5,096,0/63

Notice: This application is as filed and may therefore contain an
incomplete specification.



Industrie Canada Industry Canada

3488

Canada



METHOD OF MAKING A HOCKEY STICK AND STRUCTURE OF SUCH HOCKEY
STICK

ABSTRACT OF THE DISCLOSURE

A method of making a hockey stick comprises the steps of: placing a mandrel of a predetermined length in a bag of a heat-resistant material, with a metal tube being disposed outside the bag and near the open end of the bag; disposing a wooden handle at the outside of the closed end of the bag such that the wooden handle is coaxial with the mandrel; wrapping the bag, the metal tube and the wooden handle with a carbon fiber fabric sheet preimpregnated with epoxy resin; withdrawing the mandrel so that the bag, the metal tube, the wooden handle and the carbon fiber fabric sheet form together a primary stick; arranging the primary stick in a cavity of a molding tool provided with an air tube; closing the molding tool and then heating the molding tool at a temperature slightly higher than a melting point of the epoxy resin before injecting a compressed air under a predetermined pressure into the bag via the air tube of the molding tool; and cooling the molding tool and removing therefrom a freshly made hockey stick.

**METHOD OF MAKING A HOCKEY STICK AND STRUCTURE OF SUCH HOCKEY
STICK**

FIELD OF THE INVENTION

The present invention relates generally to a hockey stick, and more particularly to an ice hockey stick and the method of making such ice hockey stick having a reduced weight and a specific portion with an improved structural strength.

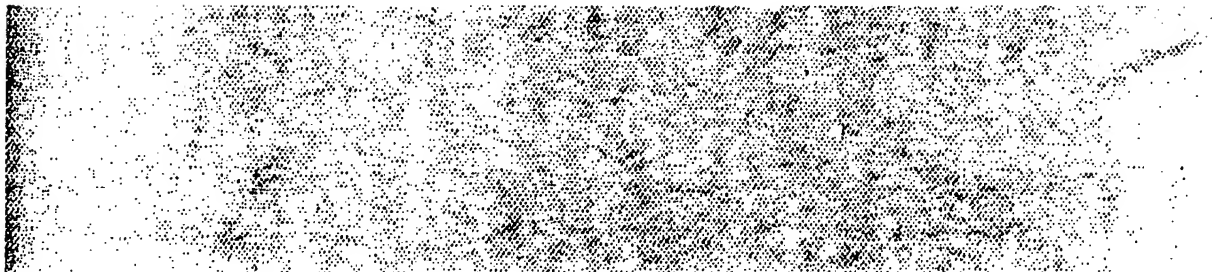
BACKGROUND OF THE INVENTION

As shown in FIG. 1, a wooden hockey stick 10 of the prior art comprises a wooden shaft 12, a plastic blade 14 having a head end provided with a cavity 16 into which the lower end of the shaft 12 is inserted adhesively. The hockey stick 10 of the prior art is quite popular among the players in view of the fact that the shaft 12 is provided with an

appropriate elasticity and is therefore capable of providing a player with a good feel when the blade 14 hits a puck. However, the hockey stick 10 described above is defective in that its shaft 12 is vulnerable to breakage and that the edge of the cavity 16 is vulnerable to cracks.

Another prior art hockey stick 20 of aluminium material is shown in FIG. 2. The hockey stick 20 comprises a tubular shaft 22 of aluminium alloy, a wooden handle 24 fastened to the top end of the shaft 22, and a plastic blade 26 fastened to the bottom end of the shaft 22. Such prior art hockey stick 20 as described above has inherent advantages that the shaft 22 of aluminium alloy is less vulnerable to breakage, and that the juncture of the shaft 22 and the blade 26 is less likely to crack because of the blade 26 which is solidly fastened to the bottom end of the shaft 22. However, such hockey stick 20 of aluminium alloy as described above is also defective in that it is too rigid to absorb the shock wave generated by the blade 26 upon hitting a puck, thereby resulting in a severe discomfort or even an injury to the wrists holding the hockey stick 20.

SUMMARY OF THE INVENTION



It is therefore the primary objective of the present invention to provide a method of making an ice hockey stick having appropriate elasticity and strength.

The foregoing objective is attained by a method of making a hockey stick, which comprises the steps of: (a) placing a mandrel of a predetermined length in a bag made of a heat-resisting material, with a metal tube being disposed outside the bag and near the open end of the bag; (b) disposing a wooden handle at the outside of the closed end of the bag such that the wooden handle is coaxial with the mandrel; (c) wrapping the bag, the metal tube and the wooden handle with a carbon fiber fabric sheet preimpregnated with epoxy resin; (d) removing the mandrel so that the bag, the metal tube, the wooden handle and the carbon fiber sheet form together a primary stick; (e) arranging the primary stick in the cavity of a molding tool provided with an air tube; (f) closing the molding tool and then heating the molding tool up to a predetermined temperature before injecting the compressed air under a predetermined pressure into the bag via the air tube of the molding tool; and (g) upon the completion of the hardening of the carbon fiber fabric layer, opening the molding tool to remove therefrom a newly formed hockey stick.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a front elevational schematic view of a wooden hockey stick of the prior art.

FIG. 2 shows a front elevational schematic view of an aluminium hockey stick of the prior art.

FIG. 3 is a schematic view showing that a wooden mandrel is contained in a heat-resistant bag, which is then wrapped with a carbon fiber fabric sheet, according to a first preferred embodiment of the present invention.

FIG. 4 shows a perspective view of a primary stick formed in the first preferred embodiment of the present invention.

FIG. 5 is a sectional view showing that the primary stick is arranged in a molding tool, according to the first preferred embodiment of the present invention.

FIG. 6 shows a sectional schematic view of a hockey stick of a second preferred embodiment of the present invention.



FIG. 7 shows another sectional schematic view of the hockey stick of the second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

As illustrated in FIGS. 3-5, a method of making a hockey stick, according to a first preferred embodiment of the present invention, includes the steps of: (a) making a plastic bag 30 of a heat-resistant material; (b) disposing a wooden mandrel 32 of an appropriate length in the plastic bag 30; (c) attaching a metal tube 34 having a rectangular cross section to an open end of the plastic bag 30; (d) disposing a wooden handle 36 in the outside of the plastic bag 30 such that a diametrically small end 362 of the wooden handle 30 is disposed at the bottom end of the plastic bag 30 and that the small end 362 is coaxial with the mandrel 32; (e) wrapping with a carbon fiber fabric sheet 38 preimpregnated with epoxy resin a portion between the metal tube and the small end 362 such that the tubular end presses against the juncture between a large end 361 and the small end 362; (f) withdrawing the mandrel 32 from the plastic bag 30 so that the carbon fiber fabric sheet 38, the metal tube 34 and the wooden handle 36 form jointly a primary stick 40; (g) using a molding tool 42 which has a cavity 43 with an

inner diameter slightly greater than the diameter of the primary stick 40 and which has an air tube 44 in communication with the cavity 43; (h) arranging the primary stick 40 in the cavity 43 such that one end of the air tube 44 is in communication with the interior of the plastic bag 30; (i) closing the molding tool 42, and then heating the molding tool 42 up to and appropriately beyond the melting point of the epoxy resin, and injecting the compressed air into the plastic bag 30 via the air tube 44 so that the outer edge of the primary stick 40 is intimately attached to the inner wall of the cavity 43; and (j) cooling the molding tool 42 before removing therefrom a newly formed hockey stick 50.

The hockey stick 50 comprises a hollow shank 38 of carbon fiber, a metal tube 34 inserted securely in the lower end of the shank 38, and a wooden handle 36 provided coaxially with a diametrically large end 361, a diametrically small end 362 inserted securely in the upper end of the shank 38, and a shoulder 363 formed between the large and the small ends 361 and 362.

The advantages inherent in the hockey stick 50 of the present invention are described and explained hereinafter.

The shank 38 of carbon fiber material is provided with appropriate flexibility and rigidity and is therefore not vulnerable to breakage and vibration.

As shown in FIG. 6, the blade 52 has a fixing end 54, which is held securely by the metal tube 34 located at the bottom end of the shank 38.

The bottom end of the shank 38 is less likely to crack at the time when the blade 52 hits a puck, thanks to the metal tube 34 which serves to reinforce the structural strength of the juncture between the shank 38 and the blade 52.

The method of the present invention may be modified, as illustrated in FIG. 7. For example, the carbon fiber fabric sheet 38 is used to wrap the plastic bag 30, the mandrel 32 and the wooden handle 36. Thereafter, the metal tube 34 is disposed at the end of the carbon fiber fabric sheet 38. As a result, the hockey stick 50 so formed is provided with the metal tube 34, which is fitted over the bottom end of the shank 38, and with a blade 56 having a blade body 561 and a top tube 562 of rectangular construction.

2103069

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of making a hockey stick comprising the following steps of:

- (a) making a bag of a heat-resistant material;
- (b) placing in said bag a mandrel of a predetermined length;
- (c) disposing a metal tube outside said bag such that said metal tube is adjacent to an open end of said bag;
- (d) disposing a wooden handle outside a closed end of said bag such that said wooden handle is coaxial with said mandrel;
- (e) wrapping said bag with a carbon fiber fabric sheet preimpregnated with epoxy resin such that one end of said metal tube and one end of said wooden handle are also wrapped with said carbon fiber fabric sheet;
- (f) setting up a molding tool having a cavity dimensioned to receive therein said mandrel and having an air tube in communication with said cavity;

(g) withdrawing said mandrel from said bag to form a primary stick made up of said bag, said metal tube, said wooden handle and said carbon fiber fabric sheet;

(h) arranging said primary stick in said cavity of said molding tool, which is then closed under a predetermined pressure;

(i) heating said molding tool at a temperature slightly higher than a melting point of said epoxy resin and injecting a compressed air under a predetermined pressure into said bag via said air tube so that an outer wall of said bag is intimately attached to an inner wall surface of said cavity;

(j) cooling said molding tool and then removing therefrom a freshly formed hockey stick.

2. The method of claim 1 wherein said mandrel is wrapped with said carbon fiber fabric sheet after said mandrel is disposed coaxially with said wooden handle in said bag; and wherein said metal tube is disposed in the outside of one end of said carbon fiber fabric sheet, with said one end being opposite to an end where said wooden handle is disposed.

3. The method of claim 1 wherein said metal tube is disposed such that said metal tube is aligned at one end thereof with one end of said carbon fiber fabric sheet.

4. The method of claim 1 wherein said wooden handle has a diametrically large end, and a diametrically small end of a predetermined length and extending from one end of said large end to be wrapped with said carbon fiber fabric sheet.

5. A hockey stick comprising:

a shank of a hollow construction;

a handle having a diametrically large end, a diametrically small end coaxial with said large end and extending to reach an interior of a top end of said shank, and a shoulder located between said large end and said small end;

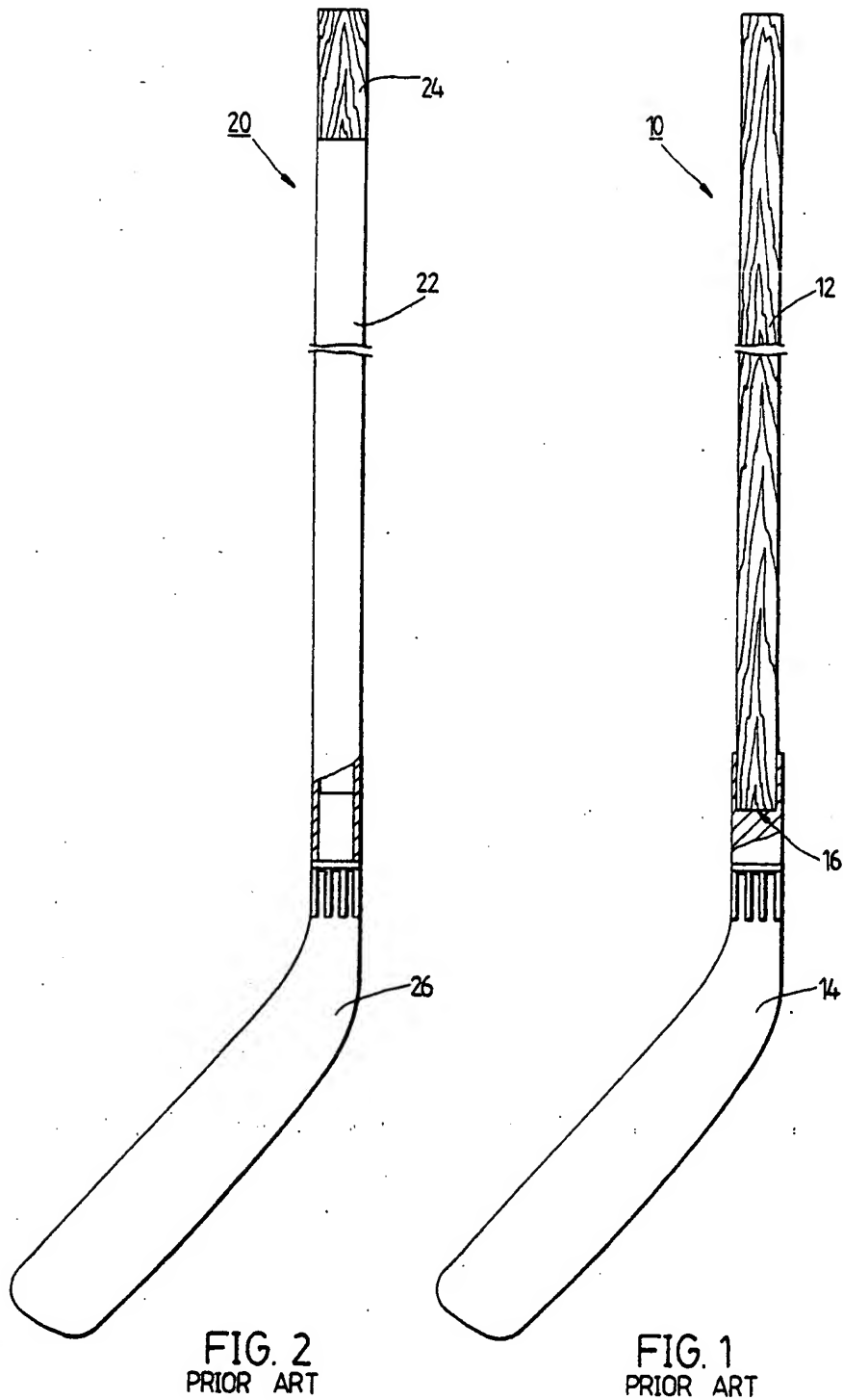
a metal tube fastened to a lower end of said shank such that a lower end edge of said metal tube is aligned with a lower end edge of said shank; and

a blade having a blade body of a predetermined thickness and a fixing end of a predetermined curvature and extending upwards from said blade body to fasten with said lower end of said shank.

6. The hockey stick of claim 5 wherein said metal tube is fitted into said lower end of said shank.

7. The hockey stick of claim 5 wherein said metal tube is fitted over said lower end of said shank.

8. The hockey stick of claim 5 wherein said shank is made mainly of carbon fiber fabric sheet.



McFadden, Fincham, Marcus & Anissimoff

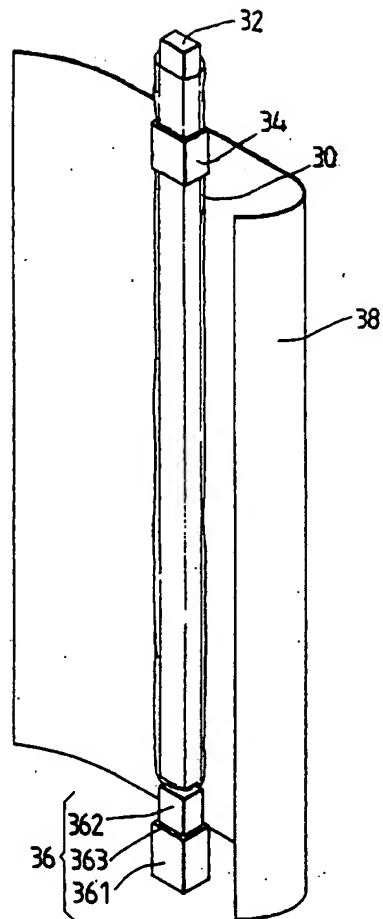


FIG. 3

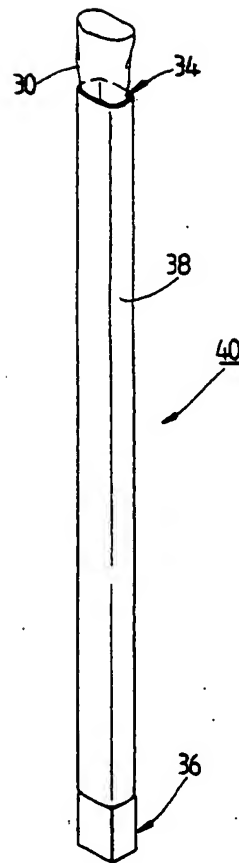


FIG. 4

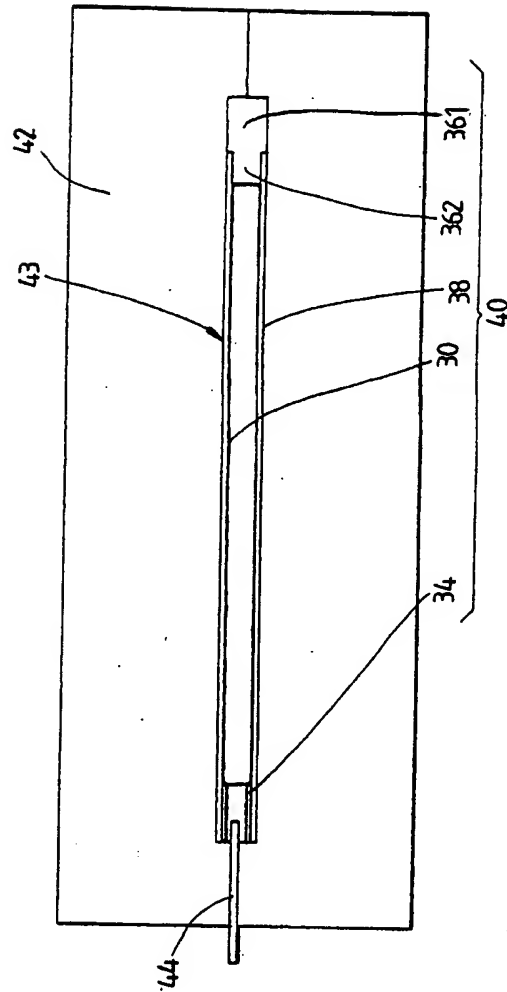


FIG. 5

